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AMINO ACID (AA) METABOLISM IN THE NEONATAL PIGLET: EFFECT OF AMINO ACID PROFILE AND AROMATIC AA LEVEL DURING TOTAL PARENTERAL NUTRITION (TPN)

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Rapidly growing neonatal piglets were used as a model for the TPN fed human low birth weight infant (LBWI) to study the effect of AA profile and aromatic AA level on growth and nitrogen utilization. Three AA profiles were studied: Vamin (based on egg albumin, but with high phenylalanine (PHE) to compensate for tyrosine (TYR) insolubility, n=15 piglets). Vaminolact (VL: based on human milk protein, but with low PHE and TYR, n=6). VL supplemented with PHE to the level delivered by Vamin (VLP, n=6). Yorkshire males weighing 1.7 kg underwent surgery at 1 to three days of age. TPN was administered by central venous line for eight days, delivering 245 kcal/kg/d and 14.5 g amino acids/kg/d. Remaining energy was supplied equally by glucose and fat. Piglets were healthy, with normal serum biochemistry and hematology.

	VL	VLP	VAMIN	SD
Weight Gain (g/kg/d)	48^a	67^b	68^b	15
Serum Urea (mmol/L)	5.1^b	2.4^a	1.7^a	0.8
Urea Excretion (mmol/kg/d)	16.5^b	6.4^a	6.0^a	2.2
Nitrogen Balance (mg/kg/d)	1435^a	1827^c	1600^b	92
Nitrogen Retention (%)	70.0^a	87.3^c	82.4^b	3.3

(a, b, c superscripts indicate significant difference at $P < 0.05$)

VL piglets showed less rapid weight gain. Measurements of urea and nitrogen metabolism indicated higher AA degradation and lower protein accretion for VL fed piglets and more efficient utilization of AA in Vamin and VLP. The increased AA degradation during VL feeding could result in more metabolic stress for the neonate. Addition of PHE to VL (VLP) improved the utilization of AA, showing aromatic AA were limiting for growth and protein accretion in VL. Thus, a higher aromatic AA level than provided in the VL profile, in the form of PHE or an alternate precursor of TYR, is required. PHE was an effective precursor of TYR in the piglet which agrees with recent data that the LBWI converts 30% of the dietary PHE from mother's milk to TYR (Darling et al. 1991). AA profile of human milk, when aromatic AA are not limiting (VLP), was superior to an egg albumin pattern (Vamin).

The piglet is highly sensitive to changes in AA profile of TPN; facilitating indepth metabolic studies to define an optimal AA profile for TPN in the human LBWI. (Supported by Natural Sciences and Engineering Research Council and Medical Research Council of Canada).

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